Menlo Park Notebook #227 [N-81-03-24]

This notebook covers the period March-October 1881. All of the entries are by Charles L. Clarke. The book contains notes and drawings of the armature for the dynamo at 65 5th Avenue, New York City and notes and calculations relating to experiments on underground conductors for the Pearl Street station. The label on the front cover is marked "Armature Wires" and is stamped "Charles L. Clarke." The book contains 278 numbered pages.

Blank pages not filmed: 16-278.

×E-172 N-81-03-24

March 24. 1881 1

Rewinding of armature for small cast-iron dynamo - for 65-5th Arc.

Formerly wound with 37 strands and 20 turns of No. 24 wire in each strand and blue resistance of 5.2 ohms.

With insulation the diam. of wire is $\frac{34}{1000}$.

If 4 turns of $\frac{42}{1000}$ are used and x is the resistance we have $\frac{20}{22^2} \times 5.2 = \frac{4}{42^2} \times x$

$\therefore x = .35$ ohm.

If 14 lb. of No. 14 wire are put on the magnets the resis. will be 1.4 ohms.

2 fields	3 ohms
1 "	1.4 "
1 armature	.35 "
	4.75

Mr. Upton states that with 6 turns at 1600 revs. it gave 60 volts with wrought iron, cast iron is $\frac{2}{3}$ the value, therefore with cast iron at 2500 revs. and 4 turns we have

42 volts on 4.75 ohms

or 8.8 volts on 1 ohm.

13.2 volts on 1½ ohms of each magnet.

Feeders - Energy on. Clarke, Oct. 12, 1885

Oct. 3rd an experiment was tried with one of the copper underground electric tubes at Edison Machine Works.

The current from 800 A lamps of 112 ohm resis. with 102 volts was passed through one of these tubes, each conductor having 262.951 cir. mils. cross section.

The tube was not sensibly warmed.

Resis. of lamp circuit $\frac{112}{800} = .14$ ohm.

Current $= 102 \times \frac{800}{112} = 729$ ampères

The resis. of one foot of tube would be (two feet of copper conductor)

$$R = \frac{10.33 \times 2}{262.951}$$

Therefore the energy lost in one foot of tube is $C^2R \times 44.3$

$$\overline{729}^2 \times \frac{20.66}{262951} \times 44.3$$

$$= 1850 \text{ ft. lbs.}$$

per foot of wire.

In one lamp at 10 volts H.P. there are 3300 ft. lbs.

Therefore $\frac{56}{100}$ of a lamp was lost on one foot of conductor.

The lamps in first district are to be 140 ohms, 10 per h.p. and it is intended to lose 15% on the feeders. 16000 lamps to be supplied.

To lose 15% the total equivalent lamps were be

$$\frac{100}{85} \text{ of } 16000$$

$$= 18824$$

Lost on feeders 2824 lamps

There are 20 feeders –
∴ 141 lamps on each feeder, and more, should have more than ½ lamp per foot of feeder.

With all the lamps on each feeder carries the current to supply 800 lamps.

Oct. 17. 1881.

With 16000 lamps the resi. of each feeder has been taken as .03126 ohms.

With 102.2 Volts on lamps the total E.M.F. will be
$\frac{100}{85}$ of 102.2 = 120.24 Volts.

With 102.24 volts on lamps the maximum loss of energy in regulating resistance (when half the lamps are on) will be

$$= \overline{120.24}^2 \times .75^2 \times \frac{.03126 \times 44.3}{(.03126 \times 2)^2}$$

$$= 115\text{-}200 \text{ ft. lb.}$$

See page 9. There should be not more than 1/2 lamp per foot lost in a feeder. Feeders a and b are respectively 767 and 295 feet long. For these will be substituted (110372 + 194968 cu. miles) the regular No. 3 of 262951 cu. miles

The resis. of the shortest wire be

$$R = \frac{10.33 \times 334}{262951}$$

$$= .01312$$

The max. energy lost in regulating resis.

$$= \frac{14407}{4 \times .01312}$$

$$= 274500 \text{ ft. lb.}$$

The resis. of next size wire is

$$R = \frac{10.33 \times 590}{262951}$$

$$.02318$$

and energy lost in regulating resis. =

$$\frac{14407}{4 \times .02318}$$

$$= 155400 \text{ ft. lb.}$$

Clarke, Oct. 27, 1885

The following are the resistances required to be successively in circuit with lamps so that they shall never be more than 105 volts or less than 102 volts.

27 ohms	1. ohm
22	.83
18	.69
15	.57
12	.47
10	.39
8	.32
6.6	.27
5.4	.22
4.5	.18
3.7	.15
3.	.125
2.5	.104
2.1	.086
1.7	.071
1.4	.059
1.2	.048
	.039
	.032